

## **4.0 Site Characterization**

---

Subsurface investigations performed at the Range, Choccolocco Corridor, Parcel 143Q, provided soil, geologic, and groundwater data used to characterize the geology and hydrogeology of the site.

### **4.1 Regional and Site Geology**

#### **4.1.1 Regional Geology**

Calhoun County includes parts of two physiographic provinces: the Piedmont Upland Province and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold-and-thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold-and-thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted, with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults, and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992) and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group consists of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984), but in Calhoun County it is either undifferentiated or divided into the Cochran and Nichols Formations and an upper, undifferentiated Wilson Ridge

and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish gray siltstone and mudstone. Massive to laminated greenish gray and black mudstone makes up the Nichols Formation, with thin interbeds of siltstone and very fine-grained sandstone (Osborne et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies appears to dominate the unit and consists primarily of coarse-grained, vitreous quartzite and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consists of sandy and micaceous shale and silty, micaceous mudstone, which are locally interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation northeast, east, and southwest of the Main Post and consists of interlayered bluish gray or pale yellowish gray sandy dolomitic limestone and siliceous dolomite with coarsely crystalline, porous chert (Osborne et al., 1989). A variegated shale and clayey silt have been included within the lower part of the Shady Dolomite (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post, as mapped by Warman and Causey (1962) and Osborne and Szabo (1984), and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome Formation consists of variegated, thinly interbedded grayish red-purple mudstone, shale, siltstone, and greenish red and light gray sandstone, with locally occurring limestone and dolomite. Weaver Cave, located approximately one mile west of the northwest boundary of the Main Post, is situated in gray dolomite and limestone mapped as the Rome Formation (Osborne et al., 1997). The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962; Osborne and Szabo, 1984) and the northern portion of the Main Post (Osborne et al., 1997). The Conasauga

Formation is composed of dark gray, finely to coarsely crystalline, medium- to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989).

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weather to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone is comprised of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped as undifferentiated at FTMC and in other parts of Calhoun County. The Athens Shale overlies the Ordovician limestone units. The Athens Shale consists of dark gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur within an eroded “window” in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post.

Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of various siltstones, sandstones, shales, dolomites, and limestones and are mapped as one, undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of interbedded red sandstone, siltstone, and shale with greenish gray to red silty and sandy limestone.

The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with shale interbeds, dolomudstone, and glauconitic limestone (Osborne, et al., 1988). This unit locally occurs in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark to light gray limestone with abundant chert nodules and

greenish gray to grayish red phosphatic shale, with increasing amounts of calcareous chert towards the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale based on fossil data.

The Pennsylvanian Parkwood Formation overlies the Floyd Shale and consists of a medium to dark gray, silty clay, shale, and mudstone with interbedded light to medium gray, very fine to fine grained, argillaceous, micaceous sandstone. Locally the Parkwood Formation also contains beds of medium to dark gray, argillaceous, bioclastic to cherty limestone and beds of clayey coal up to a few inches thick (Raymond et al., 1988). The Parkwood Formation in Calhoun County is generally found within a structurally complex area known as the Coosa deformed belt. In the deformed belt, the Parkwood Formation and Floyd Shale are mapped as undifferentiated because their lithologic similarity and significant deformation make it impractical to map the contact (Thomas and Drahovzal, 1974; Osborne et al., 1988). The undifferentiated Parkwood Formation and Floyd Shale are found throughout the western quarter of Pelham Range.

The Jacksonville thrust fault is the most significant structural geological feature in the vicinity of the Main Post of FTMC, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama, and Piedmont, Alabama. The fault is interpreted as a major splay of the Pell City fault (Osborne and Szabo, 1984). The Ordovician sequence that makes up the Eden thrust sheet is exposed at FTMC through an eroded window, or fenster, in the overlying thrust sheet. Rocks within the window display complex folding, with the folds being overturned and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formation; north by the Conasauga Formation; northeast, east, and southwest by the Shady Dolomite; and southeast and southwest by the Chilhowee Group (Osborne et al., 1997). Two small klippen of the Shady Dolomite, bounded by the Jacksonville fault, have been recognized adjacent to the Pell City fault at the FTMC window (Osborne et al., 1997).

The Pell City fault serves as a fault contact between the bedrock within the FTMC window and the Rome and Conasauga Formations. The trace of the Pell City fault is also exposed approximately nine miles west of the FTMC window on Pelham Range, where it traverses northeast to southwest across the western quarter of Pelham Range. Here, the trace of the Pell City fault marks the boundary between the Pell City thrust sheet and the Coosa deformed belt.

The eastern three-quarters of Pelham Range is located within the Pell City thrust sheet, while the remaining western quarter of Pelham Range is located within the Coosa deformed belt. The Pell City thrust sheet is a large-scale thrust sheet containing Cambrian and Ordovician rocks and is relatively less structurally complex than the Coosa deformed belt (Thomas and Neathery, 1982). The Pell City thrust sheet is exposed between the traces of the Jacksonville and Pell City faults along the western boundary of the FTMC window and along the trace of the Pell City fault on Pelham Range (Thomas and Neathery, 1982; Osborne et al., 1988). The Coosa deformed belt is a narrow northeast-to-southwest-trending linear zone of complex structure (approximately 5 to 20 miles wide and approximately 90 miles in length) consisting mainly of thin imbricate thrust slices. The structure within these imbricate thrust slices is often internally complicated by small-scale folding and additional thrust faults (Thomas and Drahovzal, 1974).

#### **4.1.2 Site Geology**

Soils at Parcel 143Q fall mainly into three mapping units: Anniston and Allen gravelly loam, Anniston and Allen gravelly clay loam, and Philo and Stendall soils, local alluvium (U.S. Department of Agriculture [USDA], 1961).

The Anniston and Allen Series of soils consists of strongly acidic, deep, well-drained soils that have developed in old local alluvium. The parent material washed from the adjacent higher-lying Linker, Muskingum, Enders, and Montevallo soils, which developed from weathered sandstone, shale, and quartzite. Sandstone and quartzite gravel and cobbles, measuring as much as 8 inches in diameter, are common throughout the soil. For this soil series, the depth to bedrock is typically from 2 feet to greater than 10 feet, with depth to water greater than 20 feet. Some severely eroded areas may be common on the surface for this soil type as well as a few shallow gullies. The typical soil description is 2 to 10 feet of well-drained stony loam to clay loam over stratified local alluvium; limestone or shale bedrock (USDA, 1961).

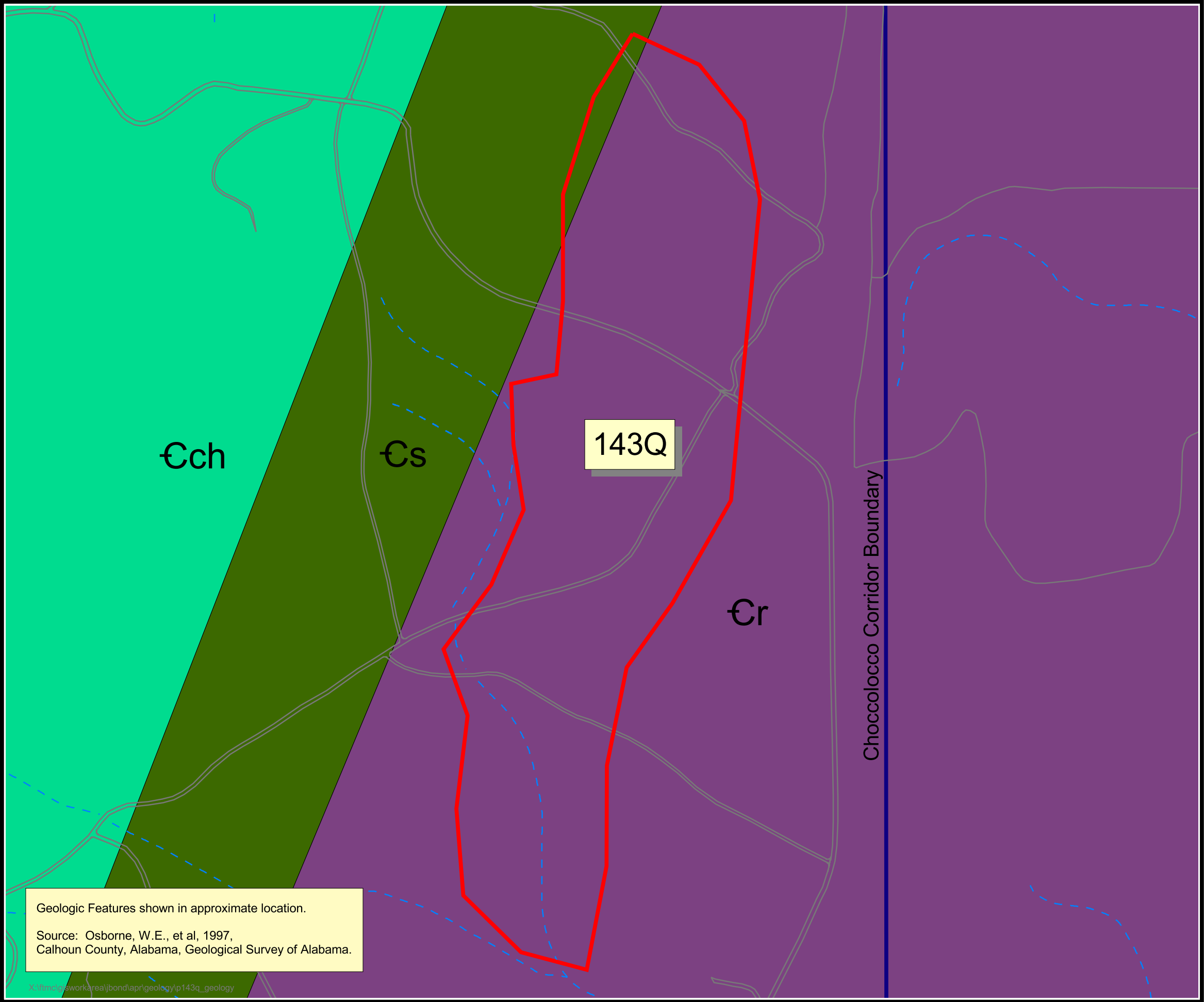
The central and southern portions of Parcel 143Q are mapped as the Anniston and Allen gravelly loams. This unit consists of friable soils that have developed in old alluvium on foot slopes and along the base of mountains. The color of the surface soil ranges from very dark brown and dark brown to reddish brown and dark reddish brown. The texture of subsoil ranges from light clay loam to clay or silty clay loam. Infiltration and runoff are medium, permeability is moderate, and the capacity for available moisture is high (USDA, 1961).

The western and northern portions of Parcel 143Q consist of the Anniston gravelly clay loam. This unit consists of a reddish brown gravelly clay loam layer 4 to 6 inches thick, underlain in most places by red or dark reddish brown gravelly clay loam. These soils have poor tilth, moderately slow infiltration, and a low capacity to hold moisture (USDA, 1961).

The Philo and Stendal soils, local alluvium occurs in areas 1 to 10 acres in size on footslopes, and at the heads of small drainageways. The soils are variable in color, texture, and consistency, but generally the surface soils are dark grayish-brown to dark-brown fine sandy loam; and the subsoil is dark-brown, slightly mottled fine sandy loam. The parent material washed mainly from sandstone and shale, but some originated from limestone. The drainage ranges from somewhat poor to moderately good (USDA, 1961).

Bedrock wells were not installed at Parcel 143Q, though the bedrock beneath the site is mapped as Shady Dolomite in the extreme northwestern portion and as the Rome Formation over the remainder of the parcel, as shown on Figure 4-1. The Shady Dolomite is typically bluish gray, thick-bedded, medium crystalline limestone and light to dark gray, argillaceous to sandy, massive to laminated dolomite with a local unit of silty clay and clayey siltstone at the base (Raymond et al., 1988). The Shady Dolomite is overlain by the Rome Formation. Within the parcel boundary, the geologic contact trends northeast to southwest. The Rome Formation consists of variegated, thinly interbedded grayish red-purple mudstone, shale, siltstone, and greenish red and light gray sandstone, with locally occurring limestone and dolomite (Raymond et al., 1988).

The residuum encountered during drilling activities at Parcel 143Q consisted of light brown to reddish brown to yellowish orange clay with some fine to coarse sand, and little silt. During drilling at HR-143Q-MW02, quartzite gravel was encountered from approximately 2 to 15 feet bgs. Auger refusal was encountered during drilling at HR-143Q-MW01 on lithology described as light brown clay, little sand, and increasing quartzite gravel.



# Figure 4-1

## Site Geologic Map

Range, Choccolocco Corridor,  
Parcel 143Q  
Choccolocco Corridor  
Fort McClellan, Alabama

### Legend

- Parcel Boundary
- Choccolocco Corridor Boundary
- Roads
- Surface Drainage Feature (dashed where intermittent)

### Geology

- Cr** Cambrian - Rome Formation
- Cs** Cambrian - Shady Dolomite
- Ch** Cambrian - Chilhowee Group, undifferentiated

300 0 300 Feet  
NAD83 State Plane Coordinates



**Shaw** Shaw Environmental, Inc.



Contract No. DACA21-96-D-0018

## **4.2 Site Hydrology**

### **4.2.1 Surface Hydrology**

Precipitation in the form of rainfall averages about 53 inches annually in Anniston, Alabama, with infiltration rates annually exceeding evapotranspiration rates (U.S. Department of Commerce, 1998). The major surface water feature in the Choccolocco Corridor is Choccolocco Creek, which flows south through the Choccolocco Corridor. Choccolocco Creek and its tributaries drain all of Choccolocco Corridor and ultimately empty into the Coosa River.

Ground elevation at Parcel 143Q ranges from approximately 780 to 885 feet above mean sea level. Surface water runoff in the northern half of Parcel 143Q drains generally to the southeast. Surface water runoff in the southern half of the parcel drains generally to the south into an intermittent stream.

### **4.2.2 Hydrogeology**

Static groundwater levels were measured in monitoring wells at Parcel 143Q and adjacent parcels on October 18, 2002, as summarized in Table 3-4. Groundwater elevations were calculated by measuring the depth to groundwater relative to the surveyed top-of-casing elevations. A groundwater flow map constructed using the October 2002 data is shown on Figure 4-2. Based on these water level data, groundwater elevations correspond with topography and flow direction in the vicinity of Parcel 143Q is to the southeast.



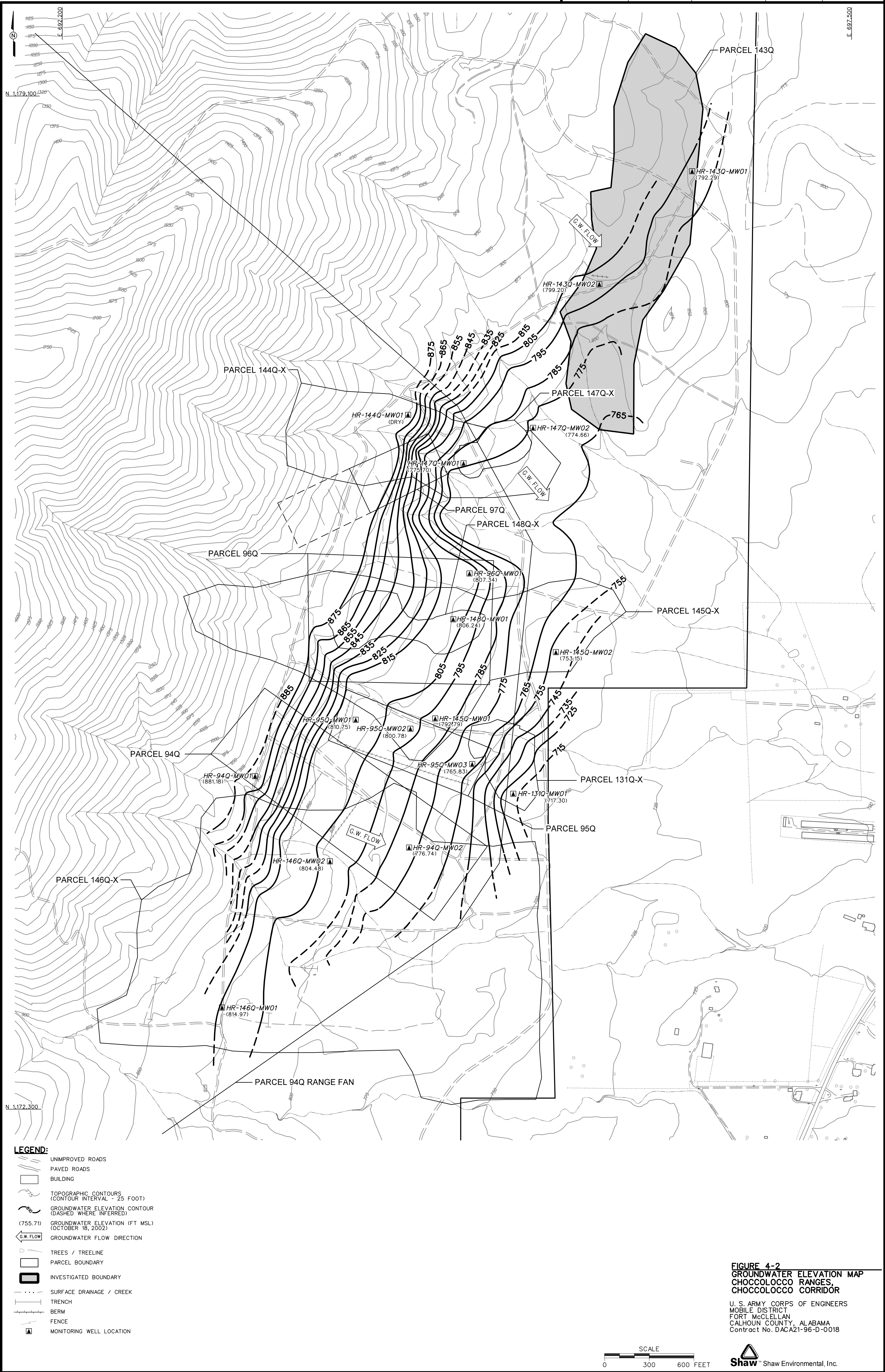


FIGURE 4-2  
GROUNDWATER ELEVATION MAP  
CHOCOLOCCO RANGES,  
CHOCOLOCCO CORRIDOR

U. S. ARMY CORPS OF ENGINEERS  
MOBILE DISTRICT  
FORT MCLELLAN  
CALHOUN COUNTY, ALABAMA  
Contract No. DACA21-96-D-0018



## 5.0 Summary of Analytical Results

---

The results of the chemical analysis of samples collected at the Range, Choccolocco Corridor, Parcel 143Q, indicate that metals, VOCs, SVOCs, and pesticides were detected in site media. Herbicides and explosive compounds were not detected in site media. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, the analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by Shaw for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC.

Metals concentrations exceeding the SSSLs and ESVs were subsequently compared to metals background screening values to determine if the metals concentrations are within natural background concentrations (Science Applications International Corporation, 1998). Site metals data were also evaluated using statistical and geochemical methods to determine if the metals were site-related (Appendix G).

The following sections and Tables 5-1 through 5-3 summarize the results of the comparison of detected constituent concentrations to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix E.

### 5.1 Surface Soil Analytical Results

Eleven surface soil samples were collected for chemical analysis at Parcel 143Q. Surface soil samples were collected from the uppermost foot of soil at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-1.

**Metals.** A total of 19 metals were detected in the surface soil samples. The concentrations of five metals (aluminum, arsenic, chromium, iron, and manganese) exceeded their respective SSSLs in one or more samples. Of these, only aluminum and manganese also exceeded their respective background concentrations:

- Aluminum (18,700 to 30,900 milligrams per kilogram [mg/kg]) exceeded its SSSL (7,803 mg/kg) and background (16,306 mg/kg) at four sample locations (HR-143Q-GP01, HR-143Q-GP04, HR-143Q-GP08, and HR-143Q-MW01).

Table 5-1

**Surface Soil Analytical Results**  
**Range, Choccolocco Corridor, Parcel 143Q**  
**Fort McClellan, Calhoun County, Alabama**

(Page 1 of 4)

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-143Q-GP01 QH0001 7-Aug-02 0-1					HR-143Q-GP02 QH0003 8-Aug-02 0-1					HR-143Q-GP03 QH0005 8-Aug-02 0-1					HR-143Q-GP04 QH0007 7-Aug-02 0-1				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>c</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>METALS</b>																								
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	3.09E+04		YES	YES	YES	1.23E+04			YES	YES	7.57E+03				YES	1.99E+04		YES	YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	7.59E+00			YES		2.82E+00			YES		2.64E+00			YES		6.17E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	1.36E+02	J	YES			4.38E+01	J				6.05E+01	J				7.01E+01	J			
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	8.21E-01	J	YES			ND										5.52E-01	J			
Calcium	mg/kg	1.72E+03	NA	NA	2.43E+03		YES			2.22E+02					3.50E+02					3.60E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.72E+01				YES	1.25E+01				YES	1.11E+01			YES		2.24E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	1.41E+01					4.68E+00					4.35E+00					6.85E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	1.18E+01					6.68E+00					1.20E+01					1.04E+01				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	2.75E+04			YES	YES	1.07E+04			YES	YES	1.03E+04			YES	YES	3.20E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	4.97E+01		YES			2.68E+01					1.48E+01					2.43E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	9.53E+02					2.99E+02					2.45E+02					5.28E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	3.74E+03	J	YES	YES	YES	3.23E+02	J			YES	5.77E+02	J		YES	YES	1.09E+03	J		YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	1.15E-01	J	YES		YES	2.91E-02	J				4.33E-02	J				1.11E-01		YES		YES
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	1.53E+01		YES			4.95E+00					4.57E+00					9.40E+00				
Potassium	mg/kg	8.00E+02	NA	NA	9.47E+02		YES			3.18E+02	J				2.25E+02	J				5.44E+02	J			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	2.18E+00	J	YES		YES	6.87E-01	J	YES			6.35E-01	J	YES			1.62E+00	J	YES		YES
Sodium	mg/kg	6.34E+02	NA	NA	4.44E+01	J				2.21E+01	J				2.50E+01	J				3.34E+01	J			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	4.24E+01				YES	1.74E+01				YES	1.36E+01			YES		4.46E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	5.08E+01	J	YES		YES	1.47E+01	J				1.39E+01	J				2.82E+01	J			
<b>VOLATILE ORGANIC COMPOUNDS</b>																								
1,2,4-Trimethylbenzene	mg/kg	NA	3.88E+02	1.00E-01	NR					NR					NR					2.50E-03	J			
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR					NR					2.40E-01	J			
Toluene	mg/kg	NA	1.55E+03	5.00E-02	NR					NR					NR					1.50E-03	J			
<b>SEMIVOLATILE ORGANIC COMPOUNDS</b>																								
Acenaphthylene	mg/kg	8.91E-01	4.63E+02	6.82E+02	NR					NR					NR					8.80E-02	J			
Anthracene	mg/kg	9.35E-01	2.33E+03	1.00E-01	NR					NR					NR					3.00E-01	J			YES
Benzo(a)anthracene	mg/kg	1.19E+00	8.51E-01	5.21E+00	NR					NR					NR					8.20E-01				
Benzo(a)pyrene	mg/kg	1.42E+00	8.51E-02	1.00E-01	NR					NR					NR					5.00E-01			YES	YES
Benzo(b)fluoranthene	mg/kg	1.66E+00	8.51E-01	5.98E+01	NR					NR					NR					1.30E+00			YES	
Benzo(ghi)perylene	mg/kg	9.55E-01	2.32E+02	1.19E+02	NR					NR					NR					1.60E-01	J			
Benzo(k)fluoranthene	mg/kg	1.45E+00	8.51E+00	1.48E+02	NR					NR					NR					4.50E-01				
Carbazole	mg/kg	NA	3.11E+01	NA	NR					NR					NR					6.10E-02	J			
Chrysene	mg/kg	1.40E+00	8.61E+01	4.73E+00	NR					NR					NR					1.40E+00		YES		
Dibenz(a,h)anthracene	mg/kg	7.20E-01	8.61E-02	1.84E+01	NR					NR					NR					8.00E-02	J			
Fluoranthene	mg/kg	2.03E+00	3.09E+02	1.00E-01	NR					NR					NR					1.10E+00				YES
Indeno(1,2,3-cd)pyrene	mg/kg	9.37E-01	8.51E-01	1.09E+02	NR					NR					NR					2.30E-01	J			
Pyrene	mg/kg	1.63E+00	2.33E+02	1.00E-01	NR					NR					NR					1.30E+00				YES
<b>PESTICIDES</b>																								
4,4'-DDE	mg/kg	NA	1.79E+00	2.50E-03	NR					NR					NR					1.70E-03	J			
Endrin	mg/kg	NA	2.32E+00	1.00E-03	NR					NR					NR					2.60E-03	J			YES
Methoxychlor	mg/kg	NA	3.89E+01	1.99E-02	NR					NR					NR					7.80E-02				YES
alpha-BHC	mg/kg	NA	1.00E-01	2.50E-03	NR					NR					NR					8.20E-04	J			
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	NR					NR					NR					1.80E-03	J			YES

Table 5-1

**Surface Soil Analytical Results**  
**Range, Choccolocco Corridor, Parcel 143Q**  
**Fort McClellan, Calhoun County, Alabama**

(Page 2 of 4)

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-143Q-GP05 QH0009 7-Aug-02 0-1					HR-143Q-GP06 QH0010 7-Aug-02 0-1					HR-143Q-GP07 QH0011 8-Aug-02 0-1					HR-143Q-GP08 QH0013 8-Aug-02 0-1					
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	
METALS																									
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	1.31E+04			YES	YES	1.38E+04			YES	YES	8.25E+03			YES	YES	1.87E+04		YES	YES	YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	5.21E+00			YES		4.13E+00			YES		2.33E+00			YES		5.18E+00			YES		
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	1.06E+02	J				1.16E+02	J				8.58E+01	J				1.59E+02	J	YES			
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	7.91E-01	J				7.46E-01	J				4.88E-01	J				1.15E+00		YES			YES
Calcium	mg/kg	1.72E+03	NA	NA	2.37E+02					1.93E+02					9.80E+01	J				4.66E+02					
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.97E+01				YES	1.31E+01				YES	5.11E+00			YES		1.27E+01					YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	9.86E+00					1.14E+01					2.98E+00					9.81E+00					
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	6.56E+00					7.29E+00					4.36E+00					8.42E+00					
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.91E+04			YES	YES	1.71E+04			YES	YES	7.02E+03			YES	YES	1.83E+04			YES	YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	2.48E+01					2.14E+01					1.19E+01					2.41E+01					
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	3.92E+02					4.34E+02					2.93E+02					6.23E+02					
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	1.16E+03	J		YES	YES	1.11E+03	J		YES	YES	5.51E+02	J		YES	YES	2.86E+03	J	YES	YES	YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	8.08E-02	J	YES			7.21E-02	J				3.77E-02	J				6.24E-02	J				
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	7.06E+00					9.36E+00					4.44E+00					1.09E+01		YES			
Potassium	mg/kg	8.00E+02	NA	NA	4.26E+02	J				4.54E+02	J				3.94E+02	J				7.50E+02					
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	1.25E+00	J	YES		YES	1.28E+00	J	YES		YES	5.66E-01	J	YES			1.52E+00	J	YES			YES
Sodium	mg/kg	6.34E+02	NA	NA	2.90E+01	J				3.88E+01	J				2.44E+01	J				3.02E+01	J				
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	2.27E+01				YES	2.13E+01				YES	9.22E+00			YES		2.41E+01					YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	2.04E+01	J				2.16E+01	J				1.43E+01	J				2.88E+01	J				
VOLATILE ORGANIC COMPOUNDS																									
1,2,4-Trimethylbenzene	mg/kg	NA	3.88E+02	1.00E-01	NR					NR					NR					NR					
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR					NR					NR					
Toluene	mg/kg	NA	1.55E+03	5.00E-02	NR					NR					NR					NR					
SEMIVOLATILE ORGANIC COMPOUNDS																									
Acenaphthylene	mg/kg	8.91E-01	4.63E+02	6.82E+02	NR					NR					NR					NR					
Anthracene	mg/kg	9.35E-01	2.33E+03	1.00E-01	NR					NR					NR					NR					
Benzo(a)anthracene	mg/kg	1.19E+00	8.51E-01	5.21E+00	NR					NR					NR					NR					
Benzo(a)pyrene	mg/kg	1.42E+00	8.51E-02	1.00E-01	NR					NR					NR					NR					
Benzo(b)fluoranthene	mg/kg	1.66E+00	8.51E-01	5.98E+01	NR					NR					NR					NR					
Benzo(ghi)perylene	mg/kg	9.55E-01	2.32E+02	1.19E+02	NR					NR					NR					NR					
Benzo(k)fluoranthene	mg/kg	1.45E+00	8.51E+00	1.48E+02	NR					NR					NR					NR					
Carbazole	mg/kg	NA	3.11E+01	NA	NR					NR					NR					NR					
Chrysene	mg/kg	1.40E+00	8.61E+01	4.73E+00	NR					NR					NR					NR					
Dibenz(a,h)anthracene	mg/kg	7.20E-01	8.61E-02	1.84E+01	NR					NR					NR					NR					
Fluoranthene	mg/kg	2.03E+00	3.09E+02	1.00E-01	NR					NR					NR					NR					
Indeno(1,2,3-cd)pyrene	mg/kg	9.37E-01	8.51E-01	1.09E+02	NR					NR					NR					NR					
Pyrene	mg/kg	1.63E+00	2.33E+02	1.00E-01	NR					NR					NR					NR					
PESTICIDES																									
4,4'-DDE	mg/kg	NA	1.79E+00	2.50E-03	NR					NR					NR					NR					
Endrin	mg/kg	NA	2.32E+00	1.00E-03	NR					NR					NR					NR					
Methoxychlor	mg/kg	NA	3.89E+01	1.99E-02	NR					NR					NR					NR					
alpha-BHC	mg/kg	NA	1.00E-01	2.50E-03	NR					NR					NR					NR					
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	NR					NR					NR					NR					

Table 5-1

**Surface Soil Analytical Results**  
**Range, Choccolocco Corridor, Parcel 143Q**  
**Fort McClellan, Calhoun County, Alabama**

(Page 3 of 4)

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-143Q-GP09 QH0015 7-Aug-02 0-1					HR-143Q-MW01 QH0017 7-Aug-02 0-1					HR-143Q-MW02 QH0019 7-Aug-02 0-1				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>METALS</b>																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	1.13E+04			YES	YES	2.53E+04		YES	YES	YES	1.61E+04			YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	3.14E+00			YES		7.04E+00			YES		4.87E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	6.78E+01	J				9.94E+01	J				1.04E+02	J			
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	ND					4.16E-01	J				6.50E-01	J			
Calcium	mg/kg	1.72E+03	NA	NA	1.62E+02					1.84E+02					2.31E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.36E+01				YES	2.81E+01			YES	YES	1.58E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	4.07E+00					4.17E+00					1.04E+01				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	4.81E+00					9.90E+00					7.13E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.30E+04			YES	YES	2.58E+04			YES	YES	1.81E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	1.02E+01					1.40E+01					2.00E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	2.79E+02					6.02E+02					5.48E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	4.27E+02	J		YES	YES	3.54E+02	J			YES	8.89E+02	J		YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	ND					5.68E-02	J				6.06E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	4.81E+00					9.86E+00					8.40E+00				
Potassium	mg/kg	8.00E+02	NA	NA	3.34E+02	J				6.62E+02					4.71E+02	J			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	8.69E-01	J	YES		YES	1.54E+00	J	YES		YES	1.31E+00	J	YES		YES
Sodium	mg/kg	6.34E+02	NA	NA	2.12E+01	J				2.27E+01	J				3.03E+01	J			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.91E+01				YES	4.19E+01				YES	2.35E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	1.52E+01	J				2.31E+01	J				2.11E+01	J			
<b>VOLATILE ORGANIC COMPOUNDS</b>																			
1,2,4-Trimethylbenzene	mg/kg	NA	3.88E+02	1.00E-01	NR					NR					NR				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR					NR				
Toluene	mg/kg	NA	1.55E+03	5.00E-02	NR					NR					NR				
<b>SEMIVOLATILE ORGANIC COMPOUNDS</b>																			
Acenaphthylene	mg/kg	8.91E-01	4.63E+02	6.82E+02	NR					NR					NR				
Anthracene	mg/kg	9.35E-01	2.33E+03	1.00E-01	NR					NR					NR				
Benzo(a)anthracene	mg/kg	1.19E+00	8.51E-01	5.21E+00	NR					NR					NR				
Benzo(a)pyrene	mg/kg	1.42E+00	8.51E-02	1.00E-01	NR					NR					NR				
Benzo(b)fluoranthene	mg/kg	1.66E+00	8.51E-01	5.98E+01	NR					NR					NR				
Benzo(ghi)perylene	mg/kg	9.55E-01	2.32E+02	1.19E+02	NR					NR					NR				
Benzo(k)fluoranthene	mg/kg	1.45E+00	8.51E+00	1.48E+02	NR					NR					NR				
Carbazole	mg/kg	NA	3.11E+01	NA	NR					NR					NR				
Chrysene	mg/kg	1.40E+00	8.61E+01	4.73E+00	NR					NR					NR				
Dibenz(a,h)anthracene	mg/kg	7.20E-01	8.61E-02	1.84E+01	NR					NR					NR				
Fluoranthene	mg/kg	2.03E+00	3.09E+02	1.00E-01	NR					NR					NR				
Indeno(1,2,3-cd)pyrene	mg/kg	9.37E-01	8.51E-01	1.09E+02	NR					NR					NR				
Pyrene	mg/kg	1.63E+00	2.33E+02	1.00E-01	NR					NR					NR				
<b>PESTICIDES</b>																			
4,4'-DDE	mg/kg	NA	1.79E+00	2.50E-03	NR					NR					NR				
Endrin	mg/kg	NA	2.32E+00	1.00E-03	NR					NR					NR				
Methoxychlor	mg/kg	NA	3.89E+01	1.99E-02	NR					NR					NR				
alpha-BHC	mg/kg	NA	1.00E-01	2.50E-03	NR					NR					NR				
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	NR					NR					NR				

Table 5-1

**Surface Soil Analytical Results  
Range, Choccolocco Corridor, Parcel 143Q  
Fort McClellan, Calhoun County, Alabama**

(Page 4 of 4)

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

<sup>a</sup> BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

For SVOCs, concentration listed is the background screening value for soils adjacent to asphalt as given in IT, 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

<sup>b</sup> Residential human health site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT, 2000.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

NR - Not requested.

Qual - Data validation qualifier.



Table 5-2

**Subsurface Soil Analytical Results**  
**Range, Choccolocco Corridor, Parcel 143Q**  
**Fort McClellan, Calhoun County, Alabama**

(Page 1 of 2)

Sample Location Sample Number Sample Date Sample Depth (Feet)				HR-143Q-GP01 QH0002 7-Aug-02 3 - 4				HR-143Q-GP02 QH0004 8-Aug-02 3 - 4				HR-143Q-GP03 QH0006 8-Aug-02 3 - 4				HR-143Q-GP07 QH0012 8-Aug-02 3- 3.5			
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
<b>METALS</b>																			
Aluminum	mg/kg	1.36E+04	7.80E+03	5.02E+04		YES	YES	2.67E+04		YES	YES	3.45E+04		YES	YES	1.33E+04			YES
Arsenic	mg/kg	1.83E+01	4.26E-01	7.79E+00			YES	7.05E+00			YES	9.81E+00			YES	2.84E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	5.67E+01	J			2.83E+01	J			4.72E+01	J			3.96E+01	J		
Beryllium	mg/kg	8.60E-01	9.60E+00	8.13E-01	J			ND				3.99E-01	J			ND			
Calcium	mg/kg	6.37E+02	NA	1.46E+02				6.85E+01	J			9.07E+01	J			7.03E+01	J		
Chromium	mg/kg	3.83E+01	2.32E+01	2.12E+01				3.06E+01			YES	4.87E+01		YES	YES	1.27E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	1.18E+01				ND				2.20E+00	J			2.79E+00			
Copper	mg/kg	1.94E+01	3.13E+02	1.34E+01				9.34E+00				1.53E+01				5.27E+00			
Iron	mg/kg	4.48E+04	2.34E+03	3.78E+04			YES	3.28E+04			YES	4.87E+04		YES	YES	1.29E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	5.36E+01		YES		1.50E+01				1.73E+01				8.71E+00			
Magnesium	mg/kg	7.66E+02	NA	5.89E+02				2.71E+02				6.25E+02				5.16E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	2.42E+03	J	YES	YES	1.66E+02	J			2.46E+02	J			1.24E+02	J		
Mercury	mg/kg	7.00E-02	2.33E+00	2.01E-01		YES		3.38E-01		YES		1.33E-01		YES		7.44E-02	J	YES	
Nickel	mg/kg	1.29E+01	1.54E+02	1.67E+01		YES		5.83E+00				1.07E+01				4.95E+00			
Potassium	mg/kg	7.11E+02	NA	6.41E+02				3.80E+02	J			6.06E+02				4.25E+02	J		
Selenium	mg/kg	4.70E-01	3.91E+01	2.15E+00	J	YES		1.91E+00	J	YES		2.61E+00	J	YES		ND			
Silver	mg/kg	2.40E-01	3.91E+01	ND				ND				ND				ND			
Sodium	mg/kg	7.02E+02	NA	3.77E+01	J			3.15E+01	J			2.39E+01	J			2.99E+01	J		
Thallium	mg/kg	1.40E+00	5.08E-01	ND				ND				ND				ND			
Vanadium	mg/kg	6.49E+01	5.31E+01	6.08E+01			YES	5.48E+01			YES	7.22E+01		YES	YES	1.76E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	4.03E+01	J	YES		1.25E+01	J			2.69E+01	J			1.67E+01	J		

Table 5-2

**Subsurface Soil Analytical Results**  
**Range, Choccolocco Corridor, Parcel 143Q**  
**Fort McClellan, Calhoun County, Alabama**

(Page 2 of 2)

Sample Location Sample Number Sample Date Sample Depth (Feet)				HR-143Q-GP08 QH0014 8-Aug-02 3 - 4				HR-143Q-GP09 QH0016 7-Aug-02 3 - 4				HR-143Q-MW01 QH0018 7-Aug-02 3 - 4				HR-143Q-MW02 QH0021 7-Aug-02 3 - 4			
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
<b>METALS</b>																			
Aluminum	mg/kg	1.36E+04	7.80E+03	1.23E+04			YES	2.99E+04		YES	YES	1.60E+04		YES	YES	1.35E+04			YES
Arsenic	mg/kg	1.83E+01	4.26E-01	3.19E+00			YES	8.10E+00			YES	4.89E+00			YES	3.12E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	5.20E+01	J			4.20E+01	J			6.70E+01	J			7.45E+01	J		
Beryllium	mg/kg	8.60E-01	9.60E+00	5.15E-01	J			ND				4.12E-01	J			3.85E-01	J		
Calcium	mg/kg	6.37E+02	NA	1.05E+02	J			7.65E+01	J			3.43E+02				1.16E+02			
Chromium	mg/kg	3.83E+01	2.32E+01	3.44E+01			YES	5.86E+01		YES	YES	3.84E+01		YES	YES	1.19E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	1.00E+01				1.33E+00	J			2.67E+00				4.67E+00			
Copper	mg/kg	1.94E+01	3.13E+02	7.25E+00				1.07E+01				1.20E+01				8.45E+00			
Iron	mg/kg	4.48E+04	2.34E+03	2.15E+04			YES	3.93E+04			YES	4.34E+04			YES	2.15E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	1.69E+01				1.83E+01				1.41E+01				1.20E+01			
Magnesium	mg/kg	7.66E+02	NA	3.42E+02				4.11E+02				4.34E+02				3.92E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	7.62E+02	J		YES	2.53E+02	J			2.41E+02	J			3.16E+02	J		
Mercury	mg/kg	7.00E-02	2.33E+00	8.04E-02	J	YES		1.35E-01		YES		1.59E-01		YES		7.08E-02	J	YES	
Nickel	mg/kg	1.29E+01	1.54E+02	7.15E+00				7.65E+00				6.22E+00				6.33E+00			
Potassium	mg/kg	7.11E+02	NA	3.57E+02	J			3.51E+02	J			4.34E+02	J			4.70E+02	J		
Selenium	mg/kg	4.70E-01	3.91E+01	1.23E+00	J	YES		2.04E+00	J	YES		1.92E+00	J	YES		1.24E+00	J	YES	
Silver	mg/kg	2.40E-01	3.91E+01	ND				1.30E+00	J	YES		ND				ND			
Sodium	mg/kg	7.02E+02	NA	2.64E+01	J			ND				3.49E+01	J			2.49E+01	J		
Thallium	mg/kg	1.40E+00	5.08E-01	ND				ND				1.20E+00	J		YES	ND			
Vanadium	mg/kg	6.49E+01	5.31E+01	2.48E+01				5.82E+01			YES	5.85E+01			YES	2.43E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	2.11E+01	J			1.86E+01	J			1.83E+01	J			1.66E+01	J		

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

<sup>a</sup> BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

<sup>b</sup> Residential human health site-specific screening level (SSSL) as given in IT, 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

NR - Not requested.

Qual - Data validation qualifier.



Table 5-3

**Groundwater Analytical Results**  
**Range, Choccolocco Corridor, Parcel 143Q**  
**Fort McClellan, Calhoun County, Alabama**

Sample Location Sample Number Sample Date				HR-143Q-MW01 QH3001 11-Sep-02				HR-143Q-MW02 QH3002 26-Aug-02			
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
<b>METALS</b>											
Aluminum	mg/L	2.34E+00	1.56E+00	1.06E+00				1.90E+00	J		YES
Arsenic	mg/L	1.78E-02	4.40E-05	1.82E-03	J		YES	ND			
Barium	mg/L	1.27E-01	1.10E-01	1.18E-02				9.47E-03	J		
Calcium	mg/L	5.65E+01	NA	9.53E-01	J			1.06E+00			
Cobalt	mg/L	2.34E-02	9.39E-02	1.19E-02	J			ND			
Iron	mg/L	7.04E+00	4.69E-01	9.87E-01	J		YES	1.63E+00			YES
Magnesium	mg/L	2.13E+01	NA	5.22E-01	J			6.68E-01	J		
Manganese	mg/L	5.81E-01	7.35E-02	2.37E-01			YES	3.12E-01			YES
Potassium	mg/L	7.20E+00	NA	2.17E+00	J			9.47E-01	J		
Selenium	mg/L	NA	7.82E-03	2.94E-03	J			3.00E-03	J		
Sodium	mg/L	1.48E+01	NA	4.59E+00				6.50E+00	J		
<b>VOLATILE ORGANIC COMPOUNDS</b>											
Chloroform	mg/L	NA	1.15E-03	NR				2.20E-04	J		

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

<sup>a</sup> BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

<sup>b</sup> Residential human health site-specific screening level (SSSL) as given in IT, 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

NR - Not requested.

Qual - Data validation qualifier.

- Manganese (3,740 and 2,860 mg/kg) exceeded its SSSL (363 mg/kg) and background (1,579 mg/kg) at two sample locations (HR-143Q-GP01 and HR-143Q-GP08).

Nine metals were detected at concentrations exceeding ESVs: aluminum, beryllium, chromium, iron, manganese, mercury, selenium, vanadium, and zinc. Of these, six metals also exceeded their respective background concentrations:

- Aluminum (18,700 to 30,900 mg/kg) exceeded its ESV (50 mg/kg) and background (16,306 mg/kg) at four sample locations (HR-143Q-GP01, HR-143Q-GP04, HR-143Q-GP08, and HR-143Q-MW01).
- Beryllium (1.15 mg/kg) exceeded its ESV (1.1 mg/kg) and background (0.8 mg/kg) at one sample location (HR-143Q-GP08).
- Manganese (3,740 and 2,860 mg/kg) exceeded its ESV (100 mg/kg) and background (1,579 mg/kg) at two sample locations (HR-143Q-GP01 and HR-143Q-GP08).
- Mercury (0.12 and 0.11 mg/kg) exceeded its ESV (0.1 mg/kg) and background (0.08 mg/kg) at two sample locations (HR-143Q-GP01 and HR-143Q-GP04).
- Selenium (0.87 to 2.18 mg/kg) exceeded its ESV (0.81 mg/kg) and background (0.48 mg/kg) at eight sample locations. The selenium results were flagged with a “J” data qualifier indicating that the results were estimated.
- Zinc (50.8 mg/kg) exceeded its ESV (50 mg/kg) and background (40.6 mg/kg) at one sample location (HR-143Q-GP01).

***Volatile Organic Compounds.*** One surface soil sample location (HR-143Q-GP04) was analyzed for VOCs. A total of three VOCs (1,2,4-trimethylbenzene, acetone, and toluene) were detected in the sample at estimated concentrations below their respective SSSLs and ESVs.

***Semivolatile Organic Compounds.*** One surface soil sample location (HR-143Q-GP04) was analyzed for SVOCs. Thirteen SVOCs, including 12 PAH compounds, were detected in the sample. Two PAHs, benzo(a)pyrene (0.5 mg/kg) and benzo(b)fluoranthene (1.3 mg/kg), were detected at concentrations exceeding SSSLs (0.085 and 0.85 mg/kg, respectively). Four PAHs (anthracene, benzo[a]pyrene, fluoranthene, and pyrene) were detected at concentrations (0.3 to 1.3 mg/kg) exceeding their respective ESVs (0.1 mg/kg for each compound).

**Pesticides.** One surface soil sample location (HR-143Q-GP04) was analyzed for pesticides. Five pesticides (4,4'-dichlorodiphenyldichloroethene [DDE], alpha-hexachlorocyclohexane [BHC], beta-BHC, endrin, and methoxychlor) were detected in the sample. All but one of the pesticide results were flagged with a “J” data qualifier indicating that the compounds were detected at estimated concentrations below method reporting limits. The pesticide concentrations were below their respective SSSLs. The concentrations of three pesticides exceeded ESVs:

- Beta-BHC (0.0018 mg/kg) (ESV = 0.001 mg/kg).
- Endrin (0.0026 mg/kg) (ESV = 0.001 mg/kg).
- Methoxychlor (0.078 mg/kg) (ESV = 0.02 mg/kg).

**Herbicides.** One surface soil sample location (HR-143Q-GP04) was analyzed for herbicides. Herbicides were not detected in the sample.

**Explosives.** Explosive compounds were not detected in the surface soil samples.

## **5.2 Subsurface Soil Analytical Results**

Eight subsurface soil samples were collected for chemical analysis at Parcel 143Q. Subsurface soil samples were collected at depths greater than 1 foot bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Table 5-2. The subsurface soil samples were analyzed for metals and explosive compounds only.

**Metals.** A total of 21 metals were detected in the subsurface soil samples. The concentrations of seven metals (aluminum, arsenic, chromium, iron, manganese, thallium, and vanadium) exceeded their respective SSSLs in one or more samples. Of these, aluminum, chromium, iron, manganese, and vanadium also exceeded their respective background concentrations in one or more samples:

- Aluminum (16,000 to 50,200 mg/kg) exceeded its SSSL (7,803 mg/kg) and background (13,591 mg/kg) at five sample locations.
- Chromium (38.4 to 58.6 mg/kg) exceeded its SSSL (23.2 mg/kg) and background (38.3 mg/kg) at three sample locations (HR-143Q-GP03, HR-143Q-GP09, and HR-143Q-MW01).

- Iron (48,700 mg/kg) exceeded its SSSL (2,345 mg/kg) and background (44,817 mg/kg) at one sample location (HR-143Q-GP03).
- Manganese (2,420 mg/kg) exceeded its SSSL (363 mg/kg) and background (1,355 mg/kg) at one sample location (HR-143Q-GP01).
- Vanadium (72.2 mg/kg) exceeded its SSSL (53.1 mg/kg) and background (64.9 mg/kg) at one sample location (HR-143Q-GP03).

**Explosives.** Explosive compounds were not detected in the subsurface soil samples.

### **5.3 Groundwater Analytical Results**

Two groundwater samples were collected for chemical analysis at Parcel 143Q at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Table 5-3.

**Metals.** A total of 11 metals were detected in the groundwater samples. The concentrations of four metals (aluminum, arsenic, iron, and manganese) exceeded their respective SSSLs but were below background values.

**Volatile Organic Compounds.** One groundwater sample location (HR-143Q-MW02) was analyzed for VOCs. One VOC (chloroform) was detected in the sample at an estimated concentration below its SSSL.

**Semivolatile Organic Compounds.** One groundwater sample location (HR-143Q-MW02) was analyzed for SVOCs. SVOCs were not detected in the sample.

**Pesticides.** One groundwater sample location (HR-143Q-MW02) was analyzed for pesticides. Pesticides were not detected in the sample.

**Herbicides.** One groundwater sample location (HR-143Q-MW02) was analyzed for herbicides. Herbicides were not detected in the sample.

**Explosives.** Explosive compounds were not detected in the groundwater samples.

#### **5.4 Statistical and Geochemical Evaluation of Site Metals Data**

Site metals data were further evaluated using statistical and geochemical methods to determine if the metals are site-related. This multi-tiered approach is described in the technical memorandum “Selecting Site-Related Chemicals for Human Health and Ecological Risk Assessments for FTMC: Revision 2” (Shaw, 2003). The statistical and geochemical evaluation determined that the metals detected in site media are present at naturally occurring levels (Appendix G).

## **6.0 Summary, Conclusions, and Recommendations**

---

Shaw completed an SI at the Range, Choccolocco Corridor, Parcel 143Q, at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site as a result of historical mission-related Army activities. The SI consisted of the collection and analysis of 11 surface soil samples, 8 subsurface soil samples, and 2 groundwater samples. In addition, two permanent residuum monitoring wells were installed in the saturated zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information.

Chemical analysis of samples collected at the site indicates that metals, VOCs, SVOCs, and pesticides were detected in site media. Herbicides and explosive compounds were not detected in any of the samples collected. Analytical results were compared to SSSLs, ESVs, and background screening values developed for human health and ecological risk evaluations as part of investigations being performed under the BRAC Environmental Restoration Program at FTMC. Site metals data were further evaluated using statistical and geochemical methods to determine if the metals were site related.

Constituents detected at concentrations exceeding SSSLs and background (where available) were identified as chemicals of potential concern (COPC) in site media. COPCs were two metals (aluminum and manganese) and two PAH compounds (benzo[a]pyrene and benzo[k]fluoranthene) in surface soil, and five metals (aluminum, chromium, iron, manganese, and vanadium) in subsurface soil. No COPCs were identified in groundwater. The statistical and geochemical evaluation determined that the metals detected in site media were naturally occurring. The PAHs were detected at low levels in one sample collected from a mound containing partially buried railroad ties. The railroad ties were most likely treated with coal tar creosote, a wood preservative, that is composed of approximately 85 percent PAHs. Therefore, the PAHs represent localized, low-level contamination directly related to the railroad ties, rather than a widespread release to the environment.

Constituents detected at concentrations exceeding ESVs and background (where available) were identified as constituents of potential ecological concern (COPEC) in surface soil. COPECs included six metals (aluminum, beryllium, manganese, mercury, selenium, and zinc), four PAH compounds (anthracene, benzo[a]pyrene, fluoranthene, and pyrene), and three pesticides (beta-

BHC, endrin, and methoxychlor). The metals detected in site media were all determined to be naturally occurring. The PAHs reflect localized, low-level contamination attributable to the presence of railroad ties located within a mound at the site. The pesticides were detected at levels within the same order of magnitude as their respective ESVs; two of the pesticides were detected at estimated levels. Given the conservatism of the ESVs and the relatively small magnitude of the exceedances, it is concluded that the levels of pesticides detected in surface soil do not pose an unacceptable risk to ecological receptors.

Based on the results of the SI, past operations at Parcel 143Q have not adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health or the environment. Therefore, Shaw recommends “No Further Action” and unrestricted land reuse with regard to CERCLA-related hazardous substances at the Range, Choccolocco Corridor, Parcel 143Q.

## 7.0 References

---

American Society for Testing and Materials (ASTM), 2000, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*, ASTM D 2488-00.

Cloud, P. E., Jr., 1966, *Bauxite Deposits of the Anniston, Fort Payne, and Asheville Areas, Northeast Alabama*, U. S. Geological Survey Bulletin 1199-O.

Environmental Science and Engineering, Inc. (ESE), 1998, *Final Environmental Baseline Survey, Fort McClellan, Alabama*, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, January.

Hunt, Roy E., 1986, *Geotechnical Engineering Techniques and Practices*, McGraw-Hill Book Co., New York.

IT Corporation (IT), 2002a, *Final Site-Specific Field Sampling Plan, Site-Specific Safety and Health Plan, and Site-Specific Unexploded Ordnance Safety Plan Attachments, Range, Choccolocco Corridor, Parcel 143Q, Fort McClellan, Calhoun County, Alabama*, April.

IT Corporation (IT), 2002b, *Draft Installation-Wide Sampling and Analysis Plan, Fort McClellan, Calhoun County, Alabama*, Revision 3, February.

IT Corporation (IT), 2000a, *Final Installation-Wide Sampling and Analysis Plan, Fort McClellan, Calhoun County, Alabama*, March.

IT Corporation (IT), 2000b, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

IT Corporation (IT), 1998, *Final Installation-Wide Work Plan, Fort McClellan, Calhoun County, Alabama*, August.

Moser, P. H., and S. S. DeJarnette, 1992, *Ground-water Availability in Calhoun County, Alabama*, Geological Survey of Alabama Special Map 228.

Osborne, W. E., 1999, Personal communication with John Hofer, IT Corporation.

Osborne, W. E., and M. W. Szabo, 1984, *Stratigraphy and Structure of the Jacksonville Fault, Calhoun County, Alabama*, Geological Survey of Alabama Circular 117.

Osborne, W. E., G. D. Irving, and W. E. Ward, 1997, *Geologic Map of the Anniston 7.5' Quadrangle, Calhoun County, Alabama*, Geological Survey of Alabama Preliminary Map, 1 sheet.



Osborne, W. E., M. W. Szabo, C. W. Copeland, Jr., and T. L. Neathery, 1989, ***Geologic Map of Alabama***, Geological Survey of Alabama Special Map 221, scale 1:500,000, 1 sheet.

Osborne, W. E., M. W. Szabo, T. L. Neathery, and C. W. Copeland, compilers, 1988, ***Geologic Map of Alabama, Northeast Sheet***, Geological Survey of Alabama Special Map 220, Scale 1:250,000.

Raymond, D. E., W. E. Osborne, C. W. Copeland, and T. L. Neathery, 1988, ***Alabama Stratigraphy***, Geological Survey of Alabama, Tuscaloosa, Alabama.

Science Applications International Corporation, 1998, ***Final Background Metals Survey Report, Fort McClellan, Alabama***, July.

Shaw Environmental, Inc. (Shaw), 2003, "Selecting Site-Related Chemicals for Human Health and Ecological Risk Assessments for FTMC: Revision 2," technical memorandum dated June 24.

Thomas, W. A., and J. A. Drahovzal, 1974, ***The Coosa Deformed Belt in the Alabama Appalachians***, Alabama Geological Society, 12<sup>th</sup> Annual Field Trip Guidebook 98 p.

Thomas, W. A., and T. L. Neathery, 1982, ***Appalachian Thrust Belts in Alabama: Tectonics and Sedimentation***, Geologic Society of America 1982 Annual Meeting, New Orleans, Louisiana, Field Trip, Alabama Geological Society Guidebook 19A.

U.S. Army Corps of Engineers (USACE), 2001a, ***Archives Search Report, Maps, Fort McClellan, Anniston, Alabama***, Revision 1, September.

U.S. Army Corps of Engineers (USACE), 2001b, ***Requirements for the Preparation of Sampling and Analysis Plans***, Engineer Manual EM 200-1-3, February.

U.S. Department of Agriculture (USDA), 1961, ***Soil Survey, Calhoun County, Alabama***, Soil Conservation Service, Series 1958, No. 9, September.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1998, Unedited Local Climatological Data, Anniston, Alabama, January - December 1998.

U.S. Environmental Protection Agency (EPA), 1990, ***Installation Assessment, Army Closure Program, Fort McClellan, Anniston, Alabama (TS-PIC-89334)***, Environmental Photographic Interpretation Center (EPIC), Environmental Monitoring Systems Laboratory.

Warman, J. C., and L. V. Causey, 1962, ***Geology and Ground-water Resources of Calhoun County, Alabama***, Geological Survey of Alabama County Report 7.

**ATTACHMENT 1**

**LIST OF ABBREVIATIONS AND ACRONYMS**

# List of Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid	ATSDR	Agency for Toxic Substances and Disease Registry	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
2,4,5-T	2,4,5-trichlorophenoxyacetic acid	ATV	all-terrain vehicle	CERFA	Community Environmental Response Facilitation Act
2,4,5-TP	2,4,5-trichlorophenoxypropionic acid	AUF	area use factor	CESAS	Corps of Engineers South Atlantic Savannah
3D	3D International Environmental Group	AWARE	Associated Water and Air Resources Engineers, Inc.	CF	conversion factor
AB	ambient blank	AWQC	ambient water quality criteria	CFC	chlorofluorocarbon
AbB3	Anniston gravelly clay loam, 2 to 6 percent slopes, severely eroded	AWWSB	Anniston Water Works and Sewer Board	CFDP	Center for Domestic Preparedness
AbC3	Anniston gravelly clay loam, 6 to 10 percent slopes, severely eroded	‘B’	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)	CFR	Code of Federal Regulations
AbD3	Anniston and Allen gravelly clay loams, 10 to 15 percent slopes, eroded	BCF	blank correction factor; bioconcentration factor	CG	phosgene (carbonyl chloride)
ABLM	adult blood lead model	BCT	BRAC Cleanup Team	CGI	combustible gas indicator
Abs	skin absorption	BERA	baseline ecological risk assessment	ch	inorganic clays of high plasticity
ABS	dermal absorption factor	BEHP	bis(2-ethylhexyl)phthalate	CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
AC	hydrogen cyanide	BFB	bromofluorobenzene	CIH	Certified Industrial Hygienist
ACAD	AutoCadd	BFE	base flood elevation	CK	cyanogen chloride
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded	BG	Bacillus globigii	cl	inorganic clays of low to medium plasticity
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded	BGR	Bains Gap Road	Cl	chlorinated
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded	bgs	below ground surface	CLP	Contract Laboratory Program
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded	BHC	hexachlorocyclohexane	cm	centimeter
ACGIH	American Conference of Governmental Industrial Hygienists	BHHRA	baseline human health risk assessment	CN	chloroacetophenone
AdE	Anniston and Allen stony loam, 10 to 25 percent slope	BIRTC	Branch Immaterial Replacement Training Center	CNB	chloroacetophenone, benzene, and carbon tetrachloride
ADEM	Alabama Department of Environmental Management	bkg	background	CNS	chloroacetophenone, chloropicrin, and chloroform
ADPH	Alabama Department of Public Health	bls	below land surface	CO	carbon monoxide
AEC	U.S. Army Environmental Center	BOD	biological oxygen demand	CO <sub>2</sub>	carbon dioxide
AEDA	ammunition, explosives, and other dangerous articles	Bp	soil-to-plant biotransfer factors	Co-60	cobalt-60
AEL	airborne exposure limit	BRAC	Base Realignment and Closure	CoA	Code of Alabama
AET	adverse effect threshold	Braun	Braun Intertec Corporation	COC	chain of custody; chemical of concern
AF	soil-to-skin adherence factor	BSAF	biota-to-sediment accumulation factors	COE	Corps of Engineers
AHA	ammunition holding area	BSC	background screening criterion	Con	skin or eye contact
AL	Alabama	BTAG	Biological Technical Assistance Group	COPC	chemical of potential concern
ALARNG	Alabama Army National Guard	BTEX	benzene, toluene, ethyl benzene, and xylenes	COPEC	constituent of potential ecological concern
ALAD	δ-aminolevulinic acid dehydratase	BTOC	below top of casing	CPOM	coarse particulate organic matter
ALDOT	Alabama Department of Transportation	BTV	background threshold value	CPSS	chemicals present in site samples
amb.	amber	BW	biological warfare; body weight	CQCSM	Contract Quality Control System Manager
amsl	above mean sea level	BZ	breathing zone; 3-quinuclidinyl benzilate	CRDL	contract-required detection limit
ANAD	Anniston Army Depot	C	ceiling limit value	CRL	certified reporting limit
AOC	area of concern	Ca	carcinogen	CRQL	contract-required quantitation limit
AP	armor piercing	CaCO <sub>3</sub>	calcium carbonate	CRZ	contamination reduction zone
APEC	areas of potential ecological concern	CAA	Clean Air Act	Cs-137	cesium-137
APT	armor-piercing tracer	CAB	chemical warfare agent breakdown products	CS	ortho-chlorobenzylidene-malononitrile
AR	analysis request	CACM	Chemical Agent Contaminated Media	CSEM	conceptual site exposure model
ARAR	applicable or relevant and appropriate requirement	CAMU	corrective action management unit	CSM	conceptual site model
AREE	area requiring environmental evaluation	CBR	chemical, biological, and radiological	CT	central tendency
AS/SVE	air sparging/soil vapor extraction	CCAL	continuing calibration	ctr.	container
ASP	Ammunition Supply Point	CCB	continuing calibration blank	CWA	chemical warfare agent; Clean Water Act
ASR	Archives Search Report	CCV	continuing calibration verification	CWM	chemical warfare material; clear, wide mouth
AST	aboveground storage tank	CD	compact disc	CX	dichloroformoxime
ASTM	American Society for Testing and Materials	CDTF	Chemical Defense Training Facility	‘D’	duplicate; dilution
AT	averaging time	CEHNC	U.S. Army Engineering and Support Center, Huntsville	D&I	detection and identification
atm-m <sup>3</sup> /mol	atmospheres per cubic meter per mole			DAAMS	depot area agent monitoring station

**List of Abbreviations and Acronyms** *(Continued)*

---

DAF	dilution-attenuation factor	EM31	Geonics Limited EM31 Terrain Conductivity Meter	FS	field split; feasibility study
DANC	decontamination agent, non-corrosive	EM61	Geonics Limited EM61 High-Resolution Metal Detector	FSP	field sampling plan
°C	degrees Celsius	EOD	explosive ordnance disposal	ft	feet
°F	degrees Fahrenheit	EODT	explosive ordnance disposal team	ft/day	feet per day
DCA	dichloroethane	EPA	U.S. Environmental Protection Agency	ft/ft	feet per foot
DCE	dichloroethene	EPC	exposure point concentration	ft/yr	feet per year
DDD	dichlorodiphenyldichloroethane	EPIC	Environmental Photographic Interpretation Center	FTA	Fire Training Area
DDE	dichlorodiphenyldichloroethene	EPRI	Electrical Power Research Institute	FTMC	Fort McClellan
DDT	dichlorodiphenyltrichloroethane	EPT	Ephemeroptera, Plecoptera, Trichoptera	FTRRA	FTMC Reuse & Redevelopment Authority
DEH	Directorate of Engineering and Housing	ER	equipment rinsate	g	gram
DEHP	di(2-ethylhexyl)phthalate	ERA	ecological risk assessment	g/m <sup>3</sup>	gram per cubic meter
DEP	depositional soil	ER-L	effects range-low	G-856	Geometrics, Inc. G-856 magnetometer
DFTPP	decafluorotriphenylphosphine	ER-M	effects range-medium	G-858G	Geometrics, Inc. G-858G magnetic gradiometer
DI	deionized	ESE	Environmental Science and Engineering, Inc.	GAF	gastrointestinal absorption factor
DID	data item description	ESL	ecological screening level	gal	gallon
DIMP	di-isopropylmethylphosphonate	ESMP	Endangered Species Management Plan	gal/min	gallons per minute
DM	dry matter; adamsite	ESN	Environmental Services Network, Inc.	GB	sarin (isopropyl methylphosphonofluoridate)
DMBA	dimethylbenz(a)anthracene	ESV	ecological screening value	gc	clay gravels; gravel-sand-clay mixtures
DMMP	dimethylmethylphosphonate	ET	exposure time	GC	gas chromatograph
DNAPL	dense nonaqueous-phase liquid	EU	exposure unit	GCL	geosynthetic clay liner
DO	dissolved oxygen	Exp.	Explosives	GC/MS	gas chromatograph/mass spectrometer
DOD	U.S. Department of Defense	EXTOXNET	Extension Toxicology Network	GCR	geosynthetic clay liner
DOJ	U.S. Department of Justice	E-W	east to west	GFAA	graphite furnace atomic absorption
DOT	U.S. Department of Transportation	EZ	exclusion zone	GIS	Geographic Information System
DP	direct-push	FAR	Federal Acquisition Regulations	gm	silty gravels; gravel-sand-silt mixtures
DPDO	Defense Property Disposal Office	FB	field blank	gp	poorly graded gravels; gravel-sand mixtures
DPT	direct-push technology	FBI	Family Biotic Index	gpm	gallons per minute
DQO	data quality objective	FD	field duplicate	GPR	ground-penetrating radar
DRMO	Defense Reutilization and Marketing Office	FDC	Former Decontamination Complex	GPS	global positioning system
DRO	diesel range organics	FDA	U.S. Food and Drug Administration	GRA	general response action
DS	deep (subsurface) soil	Fe <sup>+3</sup>	ferric iron	GS	ground scar
DS2	Decontamination Solution Number 2	Fe <sup>+2</sup>	ferrous iron	GSA	General Services Administration; Geologic Survey of Alabama
DSERTS	Defense Site Environmental Restoration Tracking System	FedEx	Federal Express, Inc.	GSBP	Ground Scar Boiler Plant
DWEL	drinking water equivalent level	FEMA	Federal Emergency Management Agency	GSSI	Geophysical Survey Systems, Inc.
E&E	Ecology and Environment, Inc.	FFCA	Federal Facilities Compliance Act	GST	ground stain
EB	equipment blank	FFE	field flame expedient	GW	groundwater
EBS	environmental baseline survey	FFS	focused feasibility study	gw	well-graded gravels; gravel-sand mixtures
EC <sub>20</sub>	effects concentration for 20 percent of a test population	FI	fraction of exposure	H&S	health and safety
EC <sub>50</sub>	effects concentration for 50 percent of a test population	Fil	filtered	HA	hand auger
ECBC	Edgewood Chemical Biological Center	FIt	filtered	HC	mixture of hexachloroethane, aluminum powder, and zinc oxide (smoke producer)
ED	exposure duration	FMDC	Fort McClellan Development Commission	HCl	hydrochloric acid
EDD	electronic data deliverable	FML	flexible membrane liner	HD	distilled mustard (bis-[dichloroethyl]sulfide)
EF	exposure frequency	f <sub>oc</sub>	fraction organic carbon	HDPE	high-density polyethylene
EDQL	ecological data quality level	FOMRA	Former Ordnance Motor Repair Area	HE	high explosive
EE/CA	engineering evaluation and cost analysis	FOST	Finding of Suitability to Transfer	HEAST	Health Effects Assessment Summary Tables
Elev.	elevation	Foster Wheeler	Foster Wheeler Environmental Corporation	Herb.	herbicides
EM	electromagnetic	FR	Federal Register	HHRA	human health risk assessment
EMI	Environmental Management Inc.	Frtn	fraction	HI	hazard index

**List of Abbreviations and Acronyms** (Continued)

H <sub>2</sub> O <sub>2</sub>	hydrogen peroxide	kg	kilogram	MINICAMS	miniature continuous air monitoring system
HPLC	high-performance liquid chromatography	KeV	kilo electron volt	ml	inorganic silts and very fine sands
HNO <sub>3</sub>	nitric acid	K <sub>oc</sub>	organic carbon partitioning coefficient	mL	milliliter
HQ	hazard quotient	K <sub>ow</sub>	octonal-water partition coefficient	mm	millimeter
HQ <sub>screen</sub>	screening-level hazard quotient	KMnO <sub>4</sub>	potassium permanganate	MM	mounded material
hr	hour	L	liter; Lewisite (dichloro-[2-chloroethyl]sulfide)	MMBtu/hr	million Btu per hour
HRC	hydrogen releasing compound	L/kg/day	liters per kilogram per day	MNA	monitored natural attenuation
HSA	hollow-stem auger	l	liter	MnO <sub>4</sub> <sup>-</sup>	permanganate ion
HSDB	Hazardous Substance Data Bank	LAW	light anti-tank weapon	MOA	Memorandum of Agreement
HTRW	hazardous, toxic, and radioactive waste	lb	pound	MOGAS	motor vehicle gasoline
‘I’	out of control, data rejected due to low recovery	LBP	lead-based paint	MOUT	Military Operations in Urban Terrain
IASPOW	Impact Area South of POW Training Facility	LC	liquid chromatography	MP	Military Police
IATA	International Air Transport Authority	LCS	laboratory control sample	MPA	methyl phosphonic acid
ICAL	initial calibration	LCS <sub>50</sub>	lethal concentration for 50 percent population tested	MPC	maximum permissible concentration
ICB	initial calibration blank	LD <sub>50</sub>	lethal dose for 50 percent population tested	MPM	most probable munition
ICP	inductively-coupled plasma	LEL	lower explosive limit	MQL	method quantitation limit
ICRP	International Commission on Radiological Protection	LOAEL	lowest-observed-advserse-effects-level	MR	molasses residue
ICS	interference check sample	LOEC	lowest-observable-effect-concentration	MRL	method reporting limit
ID	inside diameter	LRA	land redevelopment authority	MS	matrix spike
IDL	instrument detection limit	LT	less than the certified reporting limit	mS/cm	millisiemens per centimeter
IDLH	immediately dangerous to life or health	LUC	land-use control	mS/m	millisiemens per meter
IDM	investigative-derived media	LUCAP	land-use control assurance plan	MSD	matrix spike duplicate
IDW	investigation-derived waste	LUCIP	land-use control implementation plan	MTBE	methyl tertiary butyl ether
IEUBK	Integrated Exposure Uptake Biokinetic	max	maximum	msl	mean sea level
IF	ingestion factor; inhalation factor	MB	method blank	MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
ILCR	incremental lifetime cancer risk	MCL	maximum contaminant level	mV	millivolts
IMPA	isopropylmethyl phosphonic acid	MCLG	maximum contaminant level goal	MW	monitoring well
IMR	Iron Mountain Road	MCPA	4-chloro-2-methylphenoxyacetic acid	MW1&MP	Monitoring Well Installation and Management Plan
in.	inch	MCPP	2-(2-methyl-4-chlorophenoxy)propionic acid	Na	sodium
Ing	ingestion	MCS	media cleanup standard	NA	not applicable; not available
Inh	inhalation	MD	matrix duplicate	NAD	North American Datum
IP	ionization potential	MDC	maximum detected concentration	NAD83	North American Datum of 1983
IPS	International Pipe Standard	MDCC	maximum detected constituent concentration	NaMnO <sub>4</sub>	sodium permanganate
IR	ingestion rate	MDL	method detection limit	NAVD88	North American Vertical Datum of 1988
IRDMIS	Installation Restoration Data Management Information System	mg	milligrams	NAS	National Academy of Sciences
IRIS	Integrated Risk Information Service	mg/kg	milligrams per kilogram	NCEA	National Center for Environmental Assessment
IRP	Installation Restoration Program	mg/kg/day	milligram per kilogram per day	NCP	National Contingency Plan
IS	internal standard	mg/kgbw/day	milligrams per kilogram of body weight per day	NCRP	National Council on Radiation Protection and Measurements
ISCP	Installation Spill Contingency Plan	mg/L	milligrams per liter	ND	not detected
IT	IT Corporation	mg/m <sup>3</sup>	milligrams per cubic meter	NE	no evidence; northeast
ITEMS	IT Environmental Management System™	mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils	ne	not evaluated
‘J’	estimated concentration	MHz	megahertz	NEW	net explosive weight
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded	µg/g	micrograms per gram	NFA	No Further Action
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded	µg/kg	micrograms per kilogram	NG	National Guard
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes	µg/L	micrograms per liter	NGP	National Guardsperson
JPA	Joint Powers Authority	µmhos/cm	micromhos per centimeter	ng/L	nanograms per liter
K	conductivity	MeV	mega electron volt	NGVD	National Geodetic Vertical Datum
K <sub>d</sub>	soil-water distribution coefficient	min	minimum	Ni	nickel

**List of Abbreviations and Acronyms** (Continued)

NIC	notice of intended change
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NLM	National Library of Medicine
NO <sub>3</sub> <sup>-</sup>	nitrate
NOEC	no-observable-effect-concentration
NPDES	National Pollutant Discharge Elimination System
NPW	net present worth
No.	number
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no-observed-adverse-effects-level
NR	not requested; not recorded; no risk
NRC	National Research Council
NRCC	National Research Council of Canada
NRHP	National Register of Historic Places
NRT	near real time
ns	nanosecond
N-S	north to south
NS	not surveyed
NSA	New South Associates, Inc.
nT	nanotesla
nT/m	nanoteslas per meter
NTU	nephelometric turbidity unit
nv	not validated
O <sub>2</sub>	oxygen
O <sub>3</sub>	ozone
O&G	oil and grease
O&M	operation and maintenance
OB/OD	open burning/open detonation
OD	outside diameter
OE	ordnance and explosives
oh	organic clays of medium to high plasticity
OH•	hydroxyl radical
ol	organic silts and organic silty clays of low plasticity
OP	organophosphorus
ORC	Oxygen Releasing Compound
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OVM-PID/FID	organic vapor meter-photoionization detector/flame ionization detector
OVS	oil/water separator
oz	ounce
PA	preliminary assessment
PAH	polynuclear aromatic hydrocarbon
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
Parsons	Parsons Engineering Science, Inc.
Pb	lead
PBMS	performance-based measurement system

PC	permeability coefficient
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxins
PCDF	polychlorinated dibenzofurans
PCE	perchloroethene
PCP	pentachlorophenol
PDS	Personnel Decontamination Station
PEF	particulate emission factor
PEL	permissible exposure limit
PERA	preliminary ecological risk assessment
PERC	perchloroethene
PES	potential explosive site
Pest.	pesticides
PETN	pentaerythritoltetranitrate
PFT	portable flamethrower
PG	professional geologist
PID	photoionization detector
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
PM	project manager
POC	point of contact
POL	petroleum, oils, and lubricants
POTW	publicly owned treatment works
POW	prisoner of war
PP	peristaltic pump; Proposed Plan
ppb	parts per billion
ppbv	parts per billion by volume
PPE	personal protective equipment
ppm	parts per million
PPMP	Print Plant Motor Pool
ppt	parts per thousand
PR	potential risk
PRA	preliminary risk assessment
PRG	preliminary remediation goal
PS	chloropicrin
PSSC	potential site-specific chemical
pt	peat or other highly organic silts
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QAM	quality assurance manual
QAO	quality assurance officer
QAP	installation-wide quality assurance plan
QC	quality control
QST	QST Environmental, Inc.
qty	quantity
Qual	qualifier
R	rejected data; resample; retardation factor
R&A	relevant and appropriate

RA	remedial action
RAO	remedial action objective
RBC	risk-based concentration; red blood cell
RBRG	risk-based remedial goal
RCRA	Resource Conservation and Recovery Act
RCWM	Recovered Chemical Warfare Material
RD	remedial design
RDX	cyclotrimethylenetrinitramine
ReB3	Rarden silty clay loams
REG	regular field sample
REL	recommended exposure limit
RFA	request for analysis
RfC	reference concentration
RfD	reference dose
RGO	remedial goal option
RI	remedial investigation
RL	reporting limit
RME	reasonable maximum exposure
ROD	Record of Decision
RPD	relative percent difference
RR	range residue
RRF	relative response factor
RRSE	Relative Risk Site Evaluation
RSD	relative standard deviation
RTC	Recruiting Training Center
RTECS	Registry of Toxic Effects of Chemical Substances
RTK	real-time kinematic
RWIMR	Ranges West of Iron Mountain Road
SA	exposed skin surface area
SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
SARA	Superfund Amendments and Reauthorization Act
sc	clayey sands; sand-clay mixtures
Sch.	schedule
SCM	site conceptual model
SD	sediment
SDG	sample delivery group
SDWA	Safe Drinking Water Act
SDZ	safe distance zone; surface danger zone
SEMS	Southern Environmental Management & Specialties, Inc.
SF	cancer slope factor
SFSP	site-specific field sampling plan
SGF	standard grade fuels
Shaw	Shaw Environmental, Inc.
SHP	installation-wide safety and health plan
SI	site investigation

**List of Abbreviations and Acronyms** (Continued)

SINA	Special Interest Natural Area
SL	standing liquid
SLERA	screening-level ecological risk assessment
sm	silty sands; sand-silt mixtures
SM	Serratia marcescens
SMDP	Scientific Management Decision Point
s/n	signal-to-noise ratio
SO <sub>4</sub> <sup>-2</sup>	sulfate
SOD	soil oxidant demand
SOP	standard operating procedure
SOPQAM	U.S. EPA's <i>Standard Operating Procedure/Quality Assurance Manual</i>
sp	poorly graded sands; gravelly sands
SP	submersible pump
SPCC	system performance calibration compound
SPCS	State Plane Coordinate System
SPM	sample planning module
SQRT	screening quick reference tables
Sr-90	strontium-90
SRA	streamlined human health risk assessment
SRI	supplemental remedial investigation
SRM	standard reference material
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSL	soil screening level
SSSL	site-specific screening level
SSSSL	site-specific soil screening level
STB	supertropical bleach
STC	source-term concentration
STD	standard deviation
STEL	short-term exposure limit
STL	Severn-Trent Laboratories
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units
SU	standard unit
SUXOS	senior UXO supervisor
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA's <i>Test Methods for Evaluating Solid Waste: Physical/Chemical Methods</i>
SWMU	solid waste management unit
SWPP	storm water pollution prevention plan
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TBC	to be considered

TCA	trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofurans
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDEC	Tennessee Department of Environment and Conservation
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TEA	triethylaluminum
Tetryl	trinitrophenylmethylnitramine
TERC	Total Environmental Restoration Contract
THI	target hazard index
TIC	tentatively identified compound
TLV	threshold limit value
TN	Tennessee
TNB	trinitrobenzene
TNT	trinitrotoluene
TOC	top of casing; total organic carbon
TPH	total petroleum hydrocarbons
TR	target cancer risk
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TRV	toxicity reference value
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
TWA	time-weighted average
UCL	upper confidence limit
UCR	upper certified range
'U'	not detected above reporting limit
UIC	underground injection control
UF	uncertainty factor
URF	unit risk factor
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USACMLS	U.S. Army Chemical School
USAMPS	U.S. Army Military Police School
USATCES	U.S. Army Technical Center for Explosive Safety
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USC	United States Code
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

UST	underground storage tank
UTL	upper tolerance level; upper tolerance limit
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Supervisor
UXOSO	UXO safety officer
V	vanadium
VC	vinyl chloride
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
WAC	Women's Army Corps
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WRS	Wilcoxon rank sum
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd <sup>3</sup>	cubic yards